

Name \_\_\_\_\_ Date \_\_\_\_\_ Block \_\_\_\_\_

### Half Life of Pennium

**Purpose:** To simulate the transformation of a radioactive isotope over time and to graph the data and relate it to radioactive decay and half-lives.

#### Introduction:

Some naturally occurring isotopes of elements are not stable. They slowly decompose by discarding part of the nucleus. The isotope is said to be radioactive. This nuclear decomposition is called nuclear decay. The length of time required for half of the isotope to decay is the substance's half-life. Each radioactive isotope has its own particular half-life. However, when the amount of remaining isotope is plotted against time, the resulting curve for every radioisotope has the same general shape.

#### Procedure:

1. Take a plastic cup full of pennies back to your table.
2. Count all the pennies to ensure there are 100 pennies. Record this in the Data table where it says total pennies.
3. Place all the pennies back into the cup and shake the cup for 10 seconds. Dump the pennies on the table and remove all the HEADS up pennies. The HEADS up pennies are the decayed atoms. Do not put these back in once they are taken out. Record the number removed next to shake 1 on your data table.
4. Repeat step 3 over and over again until there are no pennies remaining.
5. Clean up by placing all the pennies back in the cup and return the cup to the front table

#### Data Table:

Time (sec)	Number of pennies Remaining	Number of heads (Decayed pennies)	% pennies remaining
0	100	100	100
10			
20			
30			
40			
50			
60			
70			
80			
90			
100			
110			

**Analysis Questions:** Answer the following questions in complete sentences.

1. Graph the number of Pennies Remaining (y-axis) vs. Time (x-axis). Staple your graph to this sheet. Remember: Write a title for your graph, use a ruler to draw axes, label axes, draw a smooth curve through the points on your graph.

2. Describe the shape of the curve drawn in your graph.

3. What is a half-life?

4. In the experiment, what was the half-life of the element pennium?

5. At the end of two half-lives, what fraction of the atoms had not decayed?

6. The half-life of francium-223 is 20 seconds. How long will it take for 600 atoms of this element to decay and have only 75 atoms left?

7. It takes 25 days for a sample of polonium-210 to decay from 288 grams to 9 grams. What is the half-life?